

CLAIMS

1. A vacuum heat insulator comprising:

a core material;

5 an enveloping member covering the core material and including:

a heat seal layer;

a gas barrier layer provided outside of the heat seal layer; and

10 a protective layer provided outside of the gas barrier layer; and

a fin to which the enveloping member is welded,

wherein the vacuum heat insulator has one of following conditions in which:

15 A) a melting point of the heat seal layer is at least 200°C, and melting points of the gas barrier layer and the protective layer are higher than that of the heat seal layer; and

B) the melting point of the heat seal layer is above 100°C and below 200°C, the melting point of the protective layer is at least
20 200°C, and at least the fin is disposed on a low-temperature side of a heat-insulating surface of the vacuum heat insulator.

2. The vacuum heat insulator according to claim 1, wherein at least the protective layer includes material having flame retardance at
25 least that of VTM-2 specified in UL94 safety standard.

3. The vacuum heat insulator according to claim 2, wherein the heat seal layer and the gas barrier layer include material having

flame retardance at least that of VTM-2 specified in UL94 safety standard.

4. The vacuum heat insulator according to claim 1, wherein the
5 protective layer includes at least one of fluorine resin and imide resin.

5. The vacuum heat insulator according to claim 1, wherein the
protective layer includes a first protective layer and a second
protective layer provided outside of the first protective layer.

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6. The vacuum heat insulator according to claim 1, wherein the
heat seal layer includes fluorine resin having a melting point of at
least 200°C.

15 7. The vacuum heat insulator according to claim 6, wherein the
heat seal layer includes polychlorotrifluoroethylene.

8. The vacuum heat insulator according to claim 1, wherein the
heat seal layer includes non-oriented polypropylene having a melting
20 point of at least 150°C and below 200°C.

9. The vacuum heat insulator according to claim 1, wherein the
gas barrier layer includes:

a substrate; and
25 a gas barrier film including at least one of metal, metal
oxide, and silica.

10. The vacuum heat insulator according to claim 1, wherein

the gas barrier layer on at least one side includes:

an aramid resin film; and

a gas barrier film including at least one of metal, metal oxide, and silica.

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11. The vacuum heat insulator according to claim 1, further comprising a protective member that covers the heat seal layer at least at an end face of the enveloping member and has a flame retardance at least that of VTM-2 specified in UL94 safety standard.

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12. The vacuum heat insulator according to claim 11, wherein the protective member includes an adhesive tape compliant to UL510 FR.

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13. The vacuum heat insulator according to claim 11, wherein the protective member is a flame-retardant sealer.

14. An apparatus comprising:

a heat source at a temperature above 100°C and up to 200°C;

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a member to be protected and affected by heat of the heat source; and

a vacuum heat insulator comprising:

a core material;

an enveloping member covering the core material and

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including:

a heat seal layer;

a gas barrier layer provided outside of the heat seal layer; and

a protective layer provided outside of the gas barrier layer; and

a fin to which the enveloping member is welded;

5 wherein a melting point of the heat seal layer is at least 200°C, and melting points of the gas barrier layer and the protective layer are higher than that of the heat seal layer, and the vacuum heat insulator blocks thermal effect of the heat source on the member to be protected.

10 15. An apparatus comprising:

a heat source at a temperature above 100°C and below 200°C;

a member to be protected and affected by heat of the heat source; and

a vacuum heat insulator comprising:

15 a core material;

an enveloping member covering the core material and including:

a gas barrier layer provided outside of the heat seal layer; and

20 a protective layer provided outside of the gas barrier layer; and

a fin to which the enveloping member is welded;

25 wherein a melting point of the heat seal layer is above 100°C and below 200°C, a melting point of the protective layer is at least 200°C, at least the fin is disposed on a low-temperature side of a heat-insulating surface of the vacuum heat insulator, and the vacuum heat insulator blocks thermal effect of the heat source on the member to be

protected.

16. An apparatus comprising:

a portion to be kept warm and heated to a temperature above
5 100°C and up to 200°C; and

a vacuum heat insulator comprising:

a core material;

an enveloping member covering the core material and
including:

10 a heat seal layer;

a gas barrier layer provided outside of the heat seal
layer; and

a protective layer provided outside of the gas barrier
layer; and

15 a fin to which the enveloping member is welded;

wherein a melting point of the heat seal layer is at least
200°C, and melting points of the gas barrier layer and the
protective layer are higher than that of the heat seal layer,
and the vacuum heat insulator maintains a temperature of
20 the portion to be kept warm.

17. An apparatus comprising:

a portion to be kept warm and heated to a temperature above
100°C and below 200°C; and

25 a vacuum heat insulator comprising:

a core material;

an enveloping member covering the core material and
including:

a heat seal layer;

a gas barrier layer provided outside of the heat seal layer; and

5 a protective layer provided outside of the gas barrier layer; and

a fin to which the enveloping member is welded;

wherein a melting point of the heat seal layer is above 100°C and below 200°C, a melting point of the protective layer is at least 200°C, at least the fin is disposed on a low-temperature side of a heat-insulating surface of the vacuum heat insulator, and the vacuum heat insulator maintains a temperature of the portion to be kept warm.

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18. The apparatus according to any one of claims 14 and 15, wherein

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the apparatus is a printing machine for fixing a toner onto a recording paper;

the heat source is a fixing unit for fixing the toner onto the recording paper;

20 the member to be protected includes:

a toner storage for storing the toner to be melted and fixed onto the recording paper by the fixing unit;

a transfer unit for transferring the toner onto the recording paper; and

25 a control unit for controlling printing operation; and

the vacuum heat insulator is provided on an outer periphery of at least one of the fixing unit, the toner storage, and the control unit.

19. The apparatus according to any one of claims 16 and 17,
wherein

the apparatus is a fixing unit for melting and fixing a toner
5 onto a recording paper, provided in a printing machine;

the portion to be kept warm includes:

a heat-fixing roller provided in the fixing unit; and

a press-contacting roller provided in the fixing unit and
bringing the recording paper into press contact with the
10 heat-fixing roller; and

the vacuum heat insulator is disposed to surround at least
one of the heat-fixing roller and the press-contacting roller.

20. The apparatus using a vacuum heat insulator according to
15 any one of claims 14 and 15, wherein

the apparatus is a notebook type computer;

the heat source is a CPU;

the member to be protected is at least one of:

a housing forming an outer shell of the notebook type
20 computer;

a keyboard exposed from the notebook type computer;
and

a built-in accessory provided in the notebook type
computer;

25 the vacuum heat insulator is disposed in at least one of a
space between the CPU and a bottom surface of the housing, a space
between the CPU and the keyboard, and a space between the CPU and
the built-in accessory.

21. The apparatus according to any one of claims 16 and 17,
wherein

the apparatus is a water heater including a hot-water
5 storage therein;

the portion to be kept warm is a heater in proximity to the
hot-water storage; and

the vacuum heat insulator is disposed in at least a portion
in proximity to the heater.